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| ART UNIT | PAPER NUMBER |
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| 2813 | 17 |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/987,607 | ZHANG, HONGYONG | |
| | Examiner | Art Unit | |
| | David L. Hogans | 2813 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *18 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *2-5,7-18 and 20-23* is/are allowed.

6)☒ Claim(s) *1,6,19 and 24-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. *08/585,916* .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

This Office Action is in response to Amendment C filed on August 18, 2003.

### *Status of Claims*

Claims 1-28 are pending.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 6, 24 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by JP362274729 to Katami.

In reference to Claims 1 and 6, Katami teaches:

- forming an interlayer insulator comprising at least upper (106) and lower (105) layers, each comprising different dry etching characteristics (See Figures 1A-1G)

- etching the upper silicon nitride layer (106) using a first mask (107), wherein the lower silicon dioxide layer (105) is used as an etch stopper (See Figures 1A-1G)

- forming a second mask (107) to cover a portion of the silicon dioxide layer, which is exposed by the etching step (See Figures 1A-1G; specifically noting the overlap of photoresist (107), in Figures 1E and 1F, due to the isotropic etchant)

- selectively etching the lower silicon dioxide layer of the interlayer insulator using the second mask (107) to form a contact hole (See Figures 1A-1G)

In reference to Claims 24 and 25, Katami teaches:

- forming a first interlayer insulating film (105 – silicon dioxide) on a surface (See Figures 1A-1G)

- forming a second interlayer insulating film (106 – silicon nitride) on the first silicon dioxide interlayer insulating film, wherein said silicon nitride insulating film has a different etching characteristic from said silicon dioxide insulating film (See Figures 1A-1G)

- forming an opening in the silicon nitride film by first etching to expose a surface of the silicon dioxide film wherein said silicon dioxide film functions as an etching stopper during the first etching (See Figures 1A-1G)

- forming an opening in the silicon dioxide film by second etching the exposed surface of the silicon dioxide film (See Figures 1A-1G)

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by 5,635,423 to Huang et al.

In reference to Claim 1, Huang et al. teaches:

- forming an interlayer insulator comprising at least upper (64) and lower (63 and 62) layers, each comprising different dry etching characteristics (See columns 6-7 lines 47-44 and Figures 6(a)-6(c))

- etching the upper layer of the interlayer insulator (64) using a first mask, wherein the lower layer of the interlayer insulator (63) is used as an etch stopper (See columns 6-7 lines 47-44 and Figures 6(a)-6(c))

- forming a second mask (65) to cover a portion of the lower layer (63 and 62) of the interlayer insulator, which is exposed by the etching step (See columns 6-7 lines 47-44 and Figures 6(a)-6(c))

- selectively etching the lower layer of the interlayer insulator using the second mask (65) to form a contact hole (See columns 6-7 lines 47-44 and Figures 6(a)-6(c))

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over 5,635,423 to Huang et al.

Huang et al. teaches forming a first interlayer insulating film (53 or 63) on a surface (See columns 6-7 lines 47-44 and Figures 5(a)-5(c) and 6(a)-6(c)); forming a second interlayer insulating film (54 and 64) on the first interlayer insulating film (53 or 63), wherein the second interlayer insulating film has a different etching characteristic from the first interlayer insulating film (See columns 6-7 lines 47-44 and Figures 5(a)-5(c) and 6(a)-6(c)); forming an opening in the second interlayer insulating film by first etching to expose a surface of the

first interlayer insulating film wherein the first interlayer insulating film functions as an etching stopper during the first etching (See columns 6-7 lines 47-44 and Figures 5(a)-5(c) and 6(a)-6(c)); and forming an opening in the first interlayer insulatintg film by second etching the exposed surface of the first interlayer insulating film (See columns 6-7 lines 47-44 and Figures 5(a)-5(c) and 6(a)-6(c)).

Huang et al. fails to explicitly teach wherein the second interlayer insulating film is at least five times thicker that the first interlayer insulating film.

However, the specification contains no disclosure of either the critical nature of the claimed arrangement (i.e. – the second interlayer at least five times thicker than the first interlayer) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen arrangements are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Additionally, the Examiner has not given patentable weight to the preamble limitation of "comprising at least one thin film transistor" because "[A] claim preamble has the import that the claim as a whole suggests for it". *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995) "If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is 'necessary to give, life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). As the body

of the claim makes no reference, nor allusion, to at least one thin film transistor (i.e. - the preamble does not recite limitations of the claim), and since the above referenced preamble limitation does not give life or meaning to the claim, it is deemed to be of no patentable weight. See MPEP § 2111.02

7. Claims 6 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over 5,635,423 to Huang et al. in view of JP362274729 to Katami.

Incorporating all arguments of Claims 1 and 24 and noting that Huang et al. fails to explicitly teach wherein the upper/second interlayer insulator is silicon nitride and wherein the lower/first interlayer insulator is silicon oxide.

However, Katami, in the Abstract and Constitution, teaches wherein the upper/second interlayer insulator is silicon nitride and wherein the lower/first interlayer insulator is silicon oxide.

It would have been obvious to one of ordinary skill in the art to modify Huang et al. by incorporating a upper/second interlayer insulator comprised by silicon nitride and a lower/first interlayer insulator comprised by silicon oxide, as taught by Katami, to use the lower layer of silicon oxide as an etch stop layer.

8. Claims 19 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over 5,635,423 to Huang et al. in view of 5,063,378 to Roach.

Incorporating all arguments of Claims 1 and 24 and noting that Huang et al. fails to explicitly teach wherein the semiconductor device is a liquid crystal display device.

However, Roach, in columns 5-6 lines 60-20 and Figures 1-3, teaches etching contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode. Furthermore, Roach teaches that one would do this to provide metallization contacts to the TFT.

It would have been obvious to one of ordinary skill in the art to modify Katami by incorporating the etching of contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode, as taught by Roach, to provide metallization contacts to the TFT.

9. Claims 19 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP362274729 to Katami. in view of 5,063,378 to Roach.

Claim 19

Incorporating all arguments of Claim 1 and noting that Katami fails to explicitly teach wherein the semiconductor device is a liquid crystal display device.

However, Roach, in columns 5-6 lines 60-20 and Figures 1-3, teaches etching contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode. Furthermore, Roach teaches that one would do this to provide metallization contacts to the TFT.

It would have been obvious to one of ordinary skill in the art to modify Katami by incorporating the etching of contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode, as taught by Roach, to provide metallization contacts to the TFT.

Claim 26

Incorporating all arguments of Claim 24 and noting that Katami fails to explicitly teach wherein the semiconductor device is a liquid crystal display device.

However, Roach, in columns 5-6 lines 60-20 and Figures 1-3, teaches etching contact vias through a silicon oxide/silicon nitride insulation layer to

contact a TFT that is connected to a pixel electrode. Furthermore, Roach teaches that one would do this to provide metallization contacts to the TFT.

It would have been obvious to one of ordinary skill in the art to modify Katami by incorporating the etching of contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode, as taught by Roach, to provide metallization contacts to the TFT.

Claim 27

Katami, in Figures 1A-1G, the Abstract and the Constitution, teaches: forming a semiconductor island on an insulating surface; forming a gate insulating film comprising silicon dioxide on the semiconductor island; forming a gate electrode over the semiconductor island with the gate insulating film interposed therebetween; forming a first insulating film (105) comprising silicon dioxide over the gate insulating film and the gate electrode; forming a second insulating film (106) comprising silicon nitride on the first silicon dioxide insulating film; first etching the second insulating film to form an opening wherein said silicon dioxide film functions as an etching stopper; second etching a portion of the first insulating film in accordance with the opening of the second insulating film , thereby, exposing a surface of the semiconductor layer.

Katami fails to explicitly teach at least on thin film transistor, the gate insulating film being etched and wherein the second interlayer insulating film is at least five times thicker than the first interlayer insulating film.

However, the specification contains no disclosure of either the critical nature of the claimed arrangement (i.e. – the second interlayer at least five times thicker than the first interlayer) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen arrangements are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990) Since the element of criticality has not been met, the limitation concerning the second interlayer insulating film being at least five times thicker than the first interlayer insulating film, is given no patentable weight.

Furthermore, Roach, in Figure 3, shows contact vias etched through an extended gate oxide layer of a thin film transistor. Finally, Roach teaches etching through the extended gate oxide layer to create an uninhibited contact to the source/drain region.

It would have been obvious to one of ordinary skill in the art to modify Katami to incorporate etching through an extended gate oxide layer of a thin film transistor, as taught by Roach, to create an uninhibited contact to the source/drain region.

Claim 28

Incorporating all arguments of Claim 27 and noting that Katami fails to explicitly teach wherein the semiconductor device is a liquid crystal display device.

However, Roach, in columns 5-6 lines 60-20 and Figures 1-3, teaches etching contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode. Furthermore, Roach teaches that one would do this to provide metallization contacts to the TFT.

It would have been obvious to one of ordinary skill in the art to modify Katami by incorporating the etching of contact vias through a silicon oxide/silicon nitride insulation layer to contact a TFT that is connected to a pixel electrode, as taught by Roach, to provide metallization contacts to the TFT.

10. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP362274729 to Katami.

Katami, in Figures 1A-1G, teaches: forming a semiconductor island on an insulating surface; forming a gate insulating film comprising silicon dioxide on the semiconductor island; forming a gate electrode over the semiconductor island with the gate insulating film; forming a first insulating film (105) comprising silicon dioxide over the gate insulating film and the gate electrode; forming a second insulating film (106) comprising silicon nitride on the first silicon dioxide insulating film; first etching the second insulating film to form an opening wherein said silicon dioxide film functions as an etching stopper; second etching a portion of the first insulating film in accordance with the opening of the second insulating film , thereby, exposing a surface of the semiconductor layer.

Katami fails to explicitly teach etching through the gate oxide layer.

However, the specification contains no disclosure of either the critical nature of the claimed methodology or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen methods or upon another variable recited in the claim, the applicant must show that the chosen methods are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

### *Allowable Subject Matter*

11. Claims 2-5, 7-18 and 20-23 are allowed.

12. The following is a statement of reasons for the indication of allowable subject matter.

The prior art of record fails to teach Applicant's claimed method for manufacturing a semiconductor device with at least one thin film transistor comprising the steps of: forming a first conductive film; patterning the first conductive film to form a gate electrode; forming an interlayer insulator comprising at least two layers on the gate insulating film; removing a part of an upper layer of the interlayer insulator, the part being located over at least one of a source region and a drain region; forming a contact hole through the interlayer insulator to reach at least one of the source region and the drain region; forming a second conductive film; patterning the second conductive film to form a pixel electrode; forming a third conductive film; and patterning the third conductive film to form at least one of a source electrode and a drain electrode, which is in electrical contact with the pixel electrode.

### *Response to Arguments*

13. Applicant's arguments filed in Amendment C on August 18, 2003, have been fully considered but they are not persuasive.

The Examiner will address arguments concerning Claim 1 and not Claims 24 and 27 because Claims 24 and 27 contain substantive amendments, offered in Amendment C filed on August 18, 2003, affecting the scope of the claims.

Concerning Claim 1, the Applicant proffers that mask layer (107) cannot act as a first mask and a second mask. The Examiner maintains that mask layer (107) may act as a first and second mask because Kitami specifically chose the first etchant to be comprised by an isotropic material which causes mask layer (107) to act as a mask with a different defined width then when the second anisotropic etchant is used to remove the lower layer. The isotropic etchant removed a larger area of the upper layer than defined by the width dimension of the mask layer. Consequently, mask layer (107) then overhung a portion of the lower layer that was then etched with an anisotropic etchant, thereby, effectively forcing mask layer (107) to act as a second mask layer with a different (i.e. – smaller) dimension width. Summarily, the isotropic etchant used to remove the upper layer creates a second mask layer out of the first mask layer. The Examiner notes that the scope of Claim 1 does not encompass how the second mask layer is made but merely that one is formed.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (703) 305-3361. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

dh DA
October 23, 2003

CARL WHITEHEAD, JR.
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